NATURAL RESOURCES CONSERVATION SERVICE
CONSERVATION PRACTICE STANDARD
MULCHING
(Ac.)

CODE 484

DEFINITION

Applying plant residues, by-products or other suitable materials produced off site, to the land surface.

PURPOSE

- Conserve soil moisture
- Moderate soil temperature
- Provide erosion control
- Suppress weed growth
- Establish vegetative cover
- Improve soil condition and increase soil fertility

CONDITIONS WHERE PRACTICE APPLIES

This practice applies to all lands where mulches are needed. This practice may be used alone or in combination with other practices.

CRITERIA

General Criteria Applicable To All Purposes

The selection of mulching materials will depend primarily on site conditions and the material's availability. Mulch materials shall consist of natural and/or artificial materials such as plant residue, wood bark or chips, by-products, gravel, plastic or other equivalent materials of sufficient dimension (depth or thickness) and durability to achieve the intended purpose for the required time period.

Mulching is generally performed after grading, soil surface preparation and seeding and plantings are complete. Soil surface shall be prepared in order to achieve the desired purpose.

The mulch material shall be evenly applied and anchored to the soil. Tackifiers, emulsions, pinning, netting, crimping or other acceptable methods of anchoring will be used if needed to hold the mulch in place for specified periods.

Manufactured mulches shall be applied according to the manufacturer's specifications.

Mulching operations shall comply with federal, state and/or local laws and regulations during the installation, operation and maintenance of this practice.

Mulch material shall be relatively free of disease, noxious weed seeds, and other pests and pathogens.

Small grain straw is the recommended choice as a mulching material on conventionally seeded sites. Small grain straw shall consist of wheat, oat or rye straw.

Generally, wood fiber cellulose is the recommended type of mulch to include in the slurry mix when hydroseeding.

Depending on site conditions, additional or substitute protective measures may be used if deemed necessary. Examples include jute mesh, silt fences, straw/hay bale barriers, and soil stabilization blankets or erosion mats. Refer to the West Virginia Sediment and Erosion Control Handbook for Developing Areas for information regarding these measures.

Table 1 provides guidance for use of mulching materials. If required for specific application, see Table 2 for anchoring methods and materials. Other mulching materials may be acceptable and should be installed according to the manufacturer

recommendations. Contact the state staff specialist to determine suitability.

Additional Criteria To Conserve Soil Moisture

Mulch materials applied to the soil surface shall provide at least 60 percent cover to reduce potential evaporation.

Mulch material shall be applied prior to moisture loss. Prior to mulching, ensure soil under shallow rooted crops is moist, as these crops require a constant supply of moisture.

Additional Criteria To Moderate Soil Temperature

Mulch materials shall be selected and applied to obtain 100 percent coverage over the area treated. The material shall be of a significant thickness to persist for the period required for the temperature modification.

Additional Criteria To Provide Erosion Control

When mulching with cereal grain straw or grass hay, apply in sufficient amounts to provide 70 percent ground cover. Mulch rate shall be determined using current erosion prediction technology to reach the soil erosion objective.

When mulching with wood products such as wood chips, bark, or shavings or other wood materials, apply to a 2-inch thickness if the soil is not well-drained and to a 3- to 4-inch thickness if drainage is good. More finely textured mulches, which allow less oxygen penetration than coarser materials, should be no thicker than 1 or 2 inches. The mulch material shall provide no greater than 80 percent ground cover in order to ensure adequate air circulation.

Gravel or other inorganic material shall be applied approximately 2 inches thick and shall consist of pieces 0.75 to 2 inches in diameter. The mulch material shall provide no more than 90 percent ground cover in order to ensure adequate air circulation.

Additional Criteria To Suppress Weed Growth

The thickness of mulch will be determined by the size of the plant being mulched. Small plants must not be smothered. Mulches shall be kept clear of the stems of plants where disease is likely to occur. Mulches applied around growing plants or prior to weed seedling development shall have 100 percent ground cover. Thickness of the mulch shall be adequate to prevent emergence of targeted weeds. Plastic mulches may be used.

Additional Criteria To Establish Vegetative Cover

Mulch shall be applied at a rate that achieves 50 percent ground cover to provide protection from erosion and runoff and yet allow adequate light and air penetration to the seedbed to ensure proper germination, emergence, and disease suppression.

Additional Criteria To Improve Soil Condition And Increase Soil Fertility

To increase soil fertility, apply mulch materials with a carbon to nitrogen ratio (C:N) less than 30 to 1 such as animal manure, bio-solids, food processing wastes, or similar materials. Apply other practices such as contouring; filter strips or riparian forest buffers to assure that runoff from the mulched areas will not transport mulching materials to sensitive waterbodies. Do not apply mulch with C:N less than 20:1 to the area of designed flow in watercourses.

Credit nutrients applied with the mulch to the nutrient budget.

Use the Soil Conditioning Index to assess soil quality impacts.

CONSIDERATIONS

Consider the effects of mulching on evaporation, infiltration and runoff. Mulch material may affect microbial activity in the soil surface, increase infiltration, and decrease runoff, erosion and evaporation. Increased infiltration may increase nutrient and chemical transport below the root zone. The temperature of the surface runoff may also be lowered.

Mulched soil retains moisture, requires less watering and reduces the chance of water stress on plant materials. Mulch also minimizes evaporation from the soil surface and hence reduces losses from bare soil areas.

Mulch materials high in organic matter with a high water holding capacity and high

impermeability to water droplets may adversely affect the water needs of plants.

Clear and infra-red transmissible (IRT) plastics have the greatest warming potential. They are transparent to incoming radiation and trap the longer wavelengths radiating from the soil. Black mulches are limited to warming soils by conduction only and are less effective.

Clear mulches allow profuse weed growth and may negate the benefits of soil warming. Black mulches provide effective weed control. Wavelength selective (IRT) blends the soil warming characteristics of clear mulch with the weed control ability of black mulch.

Consider potential toxic allopathic effects that mulch material may have on other organisms. Animal and plant pest species may be incompatible with the site.

Consider the potential for increased pathogenic activity within the applied mulch material.

Keep mulches 3 to 6 inches away from plant stems and crowns to prevent disease and pest problems.

Deep mulch provides nesting habitat for ground-burrowing rodents that can chew extensively on bark on tree trunk and/or tree roots. Light mulch applied after the first cold weather may prevent rodents from nesting.

On areas subject to critical erosion, install necessary erosion control measures within areas to be mulched.

Provide adequate drainage, especially at the top of slopes, where internal water movement may cause seeps or soil slippage.

Carry out construction activities so that erosion and air/water pollution will be minimized, especially off-site. State and local laws concerning pollution abatement shall be followed.

PLANS AND SPECIFICATIONS

Specifications shall be prepared for each site and purpose and recorded using approved specification sheets, job sheets, technical notes, and narrative statements in the conservation plan, or other acceptable documentation. Documentation shall include:

- Type ***and rate*** of mulch material used
- Percent cover and/or thickness of mulch material
- Timing of application
- Listing of netting, tackifiers, or method of anchoring
- ***Any relevant environmental documentation including but not limited to the WVCPA-052 or similar form and***
- Operation and maintenance.

OPERATION AND MAINTENANCE

Mulched areas will be periodically inspected, and mulch shall be reinstalled or repaired as needed to accomplish the intended purpose.

Removal, incorporation, bio- or photo-degradation of mulch and associated materials shall be consistent with the intended purpose and site conditions.

Operation of equipment near and on the site shall not compromise the intended purpose of the mulch.

Prevent or repair any fire damage to the mulch material.

Properly collect and dispose of artificial mulch material after intended use.

Monitor and control undesirable weeds in mulched areas.

REFERENCES

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Bold italics indicate changes made or information added to the national standard by West Virginia.

Table 1. Guide to mulch materials

Mulch Material	Quality Standards	Application Rate per 1000 sq. ft.	Application Rate per acre	Remarks
Hay or Straw	Air-dried; free of undesirable seeds and coarse materials	90-115 lbs or 2-3 square bales	2-2.5 tons or 100-125 square bales	Use straw where mulch effect is to be maintained for more than 3 months. Subject to wind blowing unless kept moist or tied down. Good for critical area erosion control. Excellent for seedbed protection until vegetation is established.
Compost or Manure	Well shredded, free of excessive coarse material	400-600 lbs	8-10 tons	Use strawy manure where erosion control is needed. May create problem with weeds. Excellent moisture conservation. Resistant to wind blowing. Avoid using close to streams or water courses.
Wood Chips or Shavings	Green, air-dried or composted. Free of objectionable coarse materials	460-920 lbs	10-20 tons	Spread uniformly. Often used alone. Protect from washing on steep slopes. Excellent mulch around trees and shrubs. Potential termite problem adjacent to wood structures.
Sawdust	Green or composted. Free from objectionable coarse material.	83 cubic feet for each 1 inch depth	----------	Effective as mulch around ornamentals, small fruits, and other nursery stock. Special application rates: fruit trees 5-7"; blueberries 6"; vegetables and flowers 2-3"; blackberries and raspberries 4-7"; strawberries 3". Resistant to wind blowing. One cubic foot weighs 12-24 lbs.
Peat Moss	Dried, compressed free of coarse materials	200-400 cubic feet	----------	Effective as a mulch around ornamentals. Subject to wind blowing unless kept wet. Excellent moisture holding capacity.
Gravel or Crushed Stone	AASHTO M43 or ASTM C33 Size 3, 357 or 4	9 cubic yards	----------	Excellent permanent mulch often used alone for short slopes or around woody plants and ornamentals. Consider foot traffic in planning.
Wood Fiber Cellulose	Dyed green. No growth inhibiting factors	25-30 lbs/acre	1000-2000 lbs	Suited to short steep slopes inaccessible to straw mulching equipment. Used primarily to hold seed in place until germination occurs. Use only during normal growing season.
Excelsior Fiber Mats	Interlocking web of excelsior fibers with mulch net backing on one side only	----------	----------	Use without additional mulch. Tie down as per manufacturer specifications. Good for establishing seedings on critical slopes, ditches and waterways. Decompose slowly.
Plastic	2-4 mils.	----------	----------	Use black for weed control; use white for seeding establishment without organic mulch. Release plastic after seeding is established. Effective moisture conservation and weed control.

Table 2. Mulch anchoring guide

Anchoring Method or Material	Kind of Mulch to be Anchored	Application and Remarks
Peg or Twine	Hay or Straw	After mulching, divide areas into blocks approximately 1 square yard in size. Drive 4-6 pegs per block to within 2-3" of the soil surface. Secure mulch to surface by stretching twine between pegs in criss-cross pattern on each block. Secure around each peg with two or more turns. Drive pegs flush with soil where mowing is planned.
Mulch Netting	Hay or Straw	Consists of light-weight paper, jute, wood fiber or plastic netting. Use pegs or special staples to anchor netting and prevent blowing, according to manufacturer recommendations
Asphalt Emulsion	Hay or Straw	Apply 150-200 gallons per acre. May be environmentally damaging due to its petroleum base. Air temperature must be above 50 ^{o}F.
Chemical	Hay or Straw	Apply according to manufacturer instructions. Avoid application during rain. A 24 hour curing period is required and soil temperature must be higher than 45 ^{o}F.
Disking	Hay or Straw, Manure Compost	Apply mulch and pull a mulch anchoring tool over mulch. When a disk is used, set in straight position and pull across slope with suitable power equipment. Mulch material should be "tucked" into soil surface about 3".